can be cross-linked and or stabilized by the addition of fibronectin and or heparin sulfate. For some polymers heat can be used to alter the matrix and cross link elements of the matrix by fusing adjacent components of the construct. Polymers may also be partially solubilized to alter the structure of the material, for example brief exposure of some synthetics to alcohols or bases can partially dissolve and anneal adjacent filaments together. Some polymers may be cross-linked using chemical fusion or heat fusion techniques. Synthetic polymers generally can be cross-linked using high energy radiation (e.g., electron beams, gamma rays). These typically work by the creation of free radicals on the polymer backbone which then couple, affording cross links. Backbone free radicals can also be generated via peroxides, azo compounds, aryl ketones and other radical-producing compounds in the presence of heat or light. Reduction-oxidation reactions that produce radicals (e.g., peroxides in the presence of transition metal salts) can also be used. In many cases, functional groups on polymer backbones or side chains can be reacted to form cross-links. For example, polysaccharides can be treated with diacylchlorides to form diester cross-links. Cross-linking may also occur after application of a matrix where desirable. For example, a matrix applied to a wound may be cross-linked after application to enhance adhesion of the matrix to the wound.

The release kinetics of the substance is also controlled by manipulating the physical and chemical composition of the electroprocessed material. For example, small fibers of PGA are more susceptible to hydrolysis than larger diameter fibers of PGA. An agent delivered within an electroprocessed material composed of smaller PGA fibers is released more quickly than when prepared within a material composed of larger diameter PGA fibers.

In some embodiments substances such as peptides can be released in a controlled manner in a localized domain. Examples include embodiments in which the substance is chemically or covalently bonded to the electroprocessed material. The formation of peptide gradients is a critical regulatory component of many biological processes, for example in neovasculogenesis. In surgical applications, anti-vascular peptides or anti-sense oligonucleotides can be incorporated into an electroprocessed material that is then wrapped around or placed within a tumor that is inaccessible to conventional treatments to allow for localized release and effect. Release of the anti-vascular substances suppresses tumor growth. Antisense oligonucleotides can be released from the construct into

the tumor and used to suppress the expression gene sequences of interest. In another example anti-sense sequences directed against gene sequences that control proliferation can be delivered within an electroprocessed matrix coated stent. The stretch normally associated with the placement of the stent initiates smooth muscle cell proliferation, and anti-sense sequences designed to suppress cell division reduce the deleterious effects of the smooth muscle cell proliferation associated with the procedure. In another embodiments, the electroprocessed material delivers sense and antisense oligonucleotides to promote or to inhibit localized cell function for a period of time. For example, an antisense oligonucleotide is released from an electroprocessed material to suppress the expression of a deleterious enzyme in a wound. Examples of such enzymes are matrix metalloproteinases (MMPs), which are often overexpressed in chronic wounds. In another example, the electroprocessed material applied to a wound releases plasmids that contain nucleotide sequences coding for tissue inhibitors of metalloproteinases (TIMPs). Cells in the wound will express TIMPs, resulting in local delivery of TIMPs that will inhibit MMP function.

Physical processing of the formed electroprocessed material is another way to manipulate release kinetics. In some embodiments, mechanical forces, such as compression, applied to an electroprocessed material hasten the breakdown of the matrix by altering the crystalline structure of the material. Structure of the matrix is thus another parameter that can be manipulated to affect release kinetics. Polyurethanes and other elastic materials such as poly(ethylene-co-vinyl acetate), silicones, and polydienes (e.g., polyisoprene), polycaprolactone, polyglycolic acid and related polymers are examples of materials whose release rate can be altered by mechanical strain.

Release kinetics can also be controlled by preparing laminates comprising layers of electroprocessed materials with different properties and substances. For example, layered structures composed of alternating electroprocessed materials can be prepared by sequentially electroprocessing different materials onto a target. The outer layers can, for example, be tailored to dissolve faster or slower than respect the inner layers. Multiple agents can be delivered by this method, optionally at different release rates. Layers can be tailored to provide a complex, multi-kinetic release profile of a single agent over time. Using combinations of the foregoing can provide for release of multiple substances released, each with a complex profile.

Suspending a substance in particles that are incorporated in the electroprocessed material provides another means for controlling release profile. Selection of the composition of these smaller particle matrices provides yet another way to control the release of compounds from the electroprocessed material. The release profile can be tailored by the composition of the material used in the process.

Embodiments also exist in which the substances are contained in liposomes or other vesicles in the electroprocessed matrix. Vesicles are prepared that will release one or more compounds when placed in fluids at a specific pH range, temperature range, or ionic concentration. Methods for preparing such vesicles are known to persons of skill in the art. The electroprocessed material can be delivered to a site of interest immediately or is stored either dry or at a pH at which release will not occur, and then delivered to a location containing liquids that have a pH at which release will occur. An example of this embodiment is an electroprocessed material containing vesicles that will release a desired compound at the pH of blood or other fluids released from a wound. The matrix is placed over a wound and releases fluids upon discharge of fluids from the wound.

Incorporating constituents that are magnetically sensitive or electrically sensitive into the electroprocessed material provides another means of controlling the release profile. A magnetic or electric field can then be subsequently applied to some or all of the matrix to alter the shape, porosity and/or density of the electroprocessed material. For example, a field can stimulate movement or conformational changes in the matrix due to the movement of magnetically or electrically sensitive particles. Such movement can affect the release of compounds from the electroprocessed material. For example, altering the conformation of the material can increase or decrease the extent to which the material is favorable for compound release.

In some embodiments, magnetic or electrically sensitive constituents that have been processed or co-processed with an electroprocessed material can be implanted subdermally to allow delivery of a drug over a long interval of time. By passing a magnetic field or an electrical field across the material, drug release is induced. The electroprocessed material structure is stable and does not substantially change without electromagnetic stimulation. Such embodiments provide controlled drug delivery over a long period of time. For example, an